

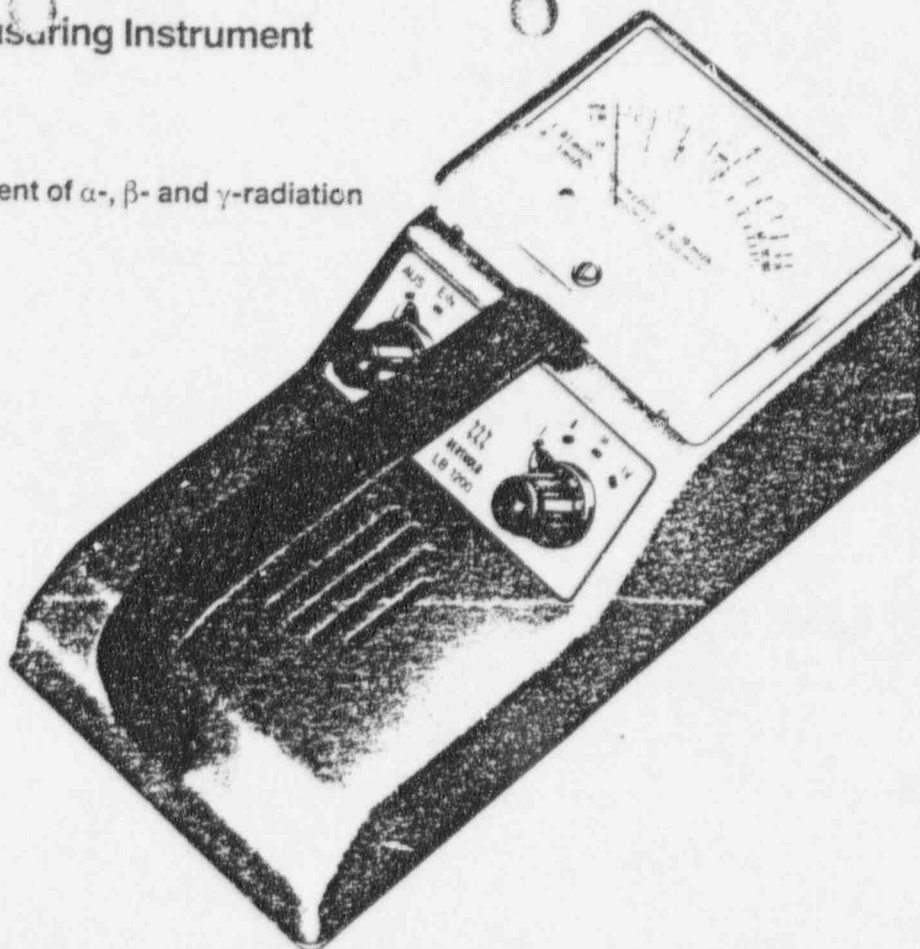
Berthold
Portable Radiation Measuring
Instruments

LB 1200

RATO/F

Radiation Measuring Instrument LB 1200 ...

Handy small unit
for the measurement of α -, β - and γ -radiation



Essential Characteristics

Maximum sensitivity

The normal background of approx. $10 \mu\text{R/h}$ causes a deflection of approx. $1/3$ of the scale in the most sensitive range.

Dose rate measurement of γ -radiation from 80 keV on practically independent of wave length.

Contamination measurement of surfaces as well as measurement of β -radiation with the built-in end window counter tube, with a window of 27.8 mm \varnothing , and area-weight 1.2 or 1.5-2 mg/cm^2 .

Contamination measurement of liquids with pour-in counter 10 ml capacity, wall thickness 25 mg/cm^2 .

Contamination measurement of hollow vessels (glass containers, beakers, flasks, etc.) as well as

Measurement of air contamination with the all-metal counter tube having a wall thickness of 50 mg/cm^2 , an effective surface of 78 cm^2 , with a length of 240 mm.

Contamination measurement of table surfaces and floors with the large surface probe, having an active length of 150 mm and a active surface of more than 40 cm^2 , with a window area-weight of 1.2 or 1.5-2 mg/cm^2 .
Extended field of application of the instrument for
Simple measurement of planchets with 25 mm (1") \varnothing by external probe with end window counter tube, window 27.8 mm \varnothing , area-weight 1.2 or 1.5-2 mg/cm^2 .

Sensitivity to extended surface contaminations

(data in nCi/cm^2):

	^{14}C	^{125}I
Built-in probe	c. 0.02	c. 2
External counter tube probe LB 6511	c. 0.02	c. 2
Large-surface probe LB 6515	c. 0.01	c. 1

Sensitivity to extended volume contaminations by

a) Fission products (equivalent to 1 MeV)

	Air	Water
LB 6513	c. $20 \cdot 10^{-9} \mu\text{Ci/ml}$	c. $10 \cdot 10^{-6} \mu\text{Ci/ml}$
LB 6510	-	c. $10 \cdot 10^{-6} \mu\text{Ci/ml}$

b) ^{90}Sr - ^{90}Y

LB 6513	c. $4 \cdot 10^{-9} \mu\text{Ci/ml}$	c. $2 \cdot 10^{-6} \mu\text{Ci/ml}$
LB 6510	-	c. $3 \cdot 10^{-6} \mu\text{Ci/ml}$

... with extended applications
by external probe

Sensitivity against point contaminations

The sensitivity against ^{14}C and ^{35}S is 15% at a distance of approximately 3 mm from the emitter to the counter tube built-in in the instrument LB 1200 or to the counter tube in the external probe LB 6511. This value was found experimentally and must not be compared with figures obtained from calculations taking into account only geometry and absorption factors.

Thus for 0.1 nCi ^{14}C or ^{35}S approx. 18 c.p.m. are obtained, for higher energy β -emitters the values are even better.

Contamination protection

For the protection of the instrument against contamination during the measurement of surfaces, the exposed lower portion of the instrument can be protected by a very thin foil which hardly decreases the passage of radiation and which is fastened to the instrument with the aid of a rubber band. The foil is replaceable.

Dose rate measurement of ^{125}I sources

Today ^{125}I is one of the most important radio-isotopes for in-vitro analyses of nuclear medicine.

The dose rate and contamination measuring instrument LB 1200 offers the possibility to realize dose rate measurements with ^{125}I , at least if no higher accuracies are demanded.

In the bottom of the LB 1200 is a built-in end window GM counter tube with a metal slide which must be closed for gamma dose rate measurements with this instrument in the energy range above 80 keV.

If the dose rate of a ^{125}I source shall be determined with the LB 1200, this slide must be opened and the base side of the instrument must be turned with the window aperture of the counter tube towards the radioactive source. The indication of the instrument in mR/h has to be multiplied by the factor 0.5 to get the real value of the dose rate.

External probe

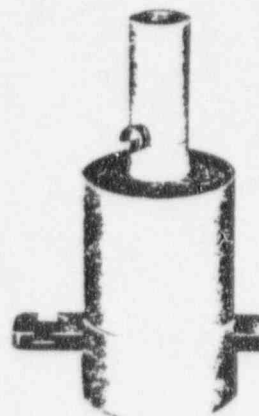
End window counter tube with a window of 27.8 mm diameter, 1.5-2 mg/cm² area-weight, LB 6511. This probe contains the same counter tube as the one incorporated in the instrument. It is used in those cases where the contamination can be measured easier with a freely mobile probe. Moreover, activity measurements of planchets and filters in the lead shield can be carried out with this probe.



LB 6511 End window counter tube probe

Shielding

During the measurement of liquids and of planchets, the detection sensitivity is increased by the use of a lead shielding of 25 mm wall thickness.



Universal lead shielding LB 7411, for measurement of 25 mm sample dishes with end window counter tube probe.

Technical Data LB 1200

Measuring ranges and time constants

I	0– 300 cpm	0– 0,1 mR/h	18 s
II	0– 3000 cpm	0– 1 mR/h	10 s
III	0–30000 cpm	0– 10 mR/h	10 s
IV		0–100 mR/h	2 s

In the ranges I and II, there is an additional **acoustical indication** as every pulse causes a click in the built-in loudspeaker.

The **scale division** is quasi-logarithmic whereby 1% of the full deflection is still readable. Since this quasi-logarithmic dial curve is produced by resistances and condensers only, high accuracy which is constant from one instrument to the next, is guaranteed.

Energy dependence for γ -radiation: $\pm 20\%$ between 0,1 and 1,5 MeV.

Resistance against overload

A dose rate of 1000 R/h does not cause a return of the pointer from full deflection in any measuring range.

Calibration accuracy: $\pm 10\%$ (calibration is performed with the γ -radiation of radium behind a 0,5 mm Pt-filter).

Functional checks

Functional checks are performed by the optical and acoustical background indication. For more accurate testing, a license-free ^{137}Cs check source can be provided.

Power supply

The instrument has two built-in DEAC cells, type 500 DKZ. The working time with fully charged cells is 12 hours in continuous operation. A charging unit for connection to 220 volts A.C. (other voltages on request) is supplied for recharging the built-in cells; charging time: 10 hours. If timely recharging was neglected, the instrument can also be powered by an external battery or, provisionally, from the mains by way of the charging unit. The stabilisation of the instrument is such that any type of battery between 1,25 and 3 volts can be used. The voltage can be checked on the measuring instrument by turning the operation switch to the corresponding position.

Temperature sensitivity

The instrument operates in an ambient temperature range of -10°C to $+50^\circ\text{C}$.

Stability against shocks and jolts: approx. 10 g, including counter tube.

Casing

The instrument is incorporated in a plastic case which is insensitive to shocks and blows. It is splash-water-proof.

Dimensions and weight: 190 x 90 x 80 mm, 800 g.

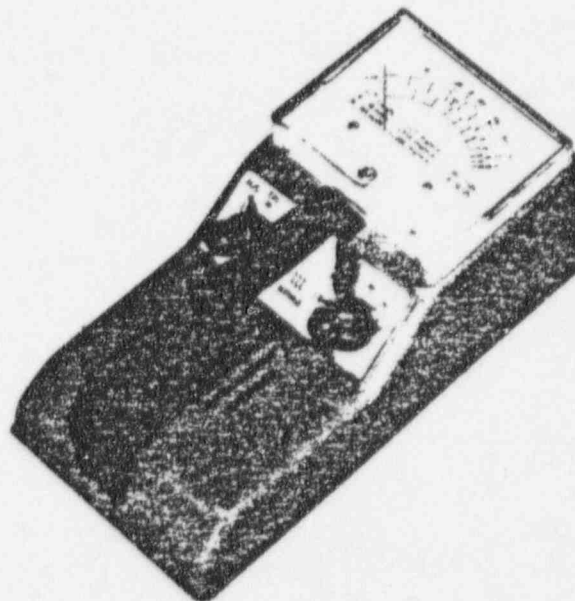
Accessories

Carrying case

A genuine cowhide leather carrying case is supplied.

Another member of the family: RATO/F for β and γ radiation measurements

The RATO/F is designed equally to the LB 1200. It has, however, higher measuring ranges. External probes cannot be connected.



Technical Data RATO/F

Measuring ranges and time constants

0– 1 mR/h	10 s
0– 10 mR/h	10 s
0–100 mR/h	1 s
0– 1 R/h	1 s
0– 10 R/h	1 s

Lowest value indicated 10 $\mu\text{R/h}$

Highest value indicated 10 R/h

Counter tubes

The instrument contains two counter tubes:

- an end window halogen counter tube with a window of 63,5 mm² area, thickness 2–3 mg/cm². This counter tube is built into the base of the instrument. This arrangement facilitates the measurement of surface contaminations since the instrument can be held like a flat-iron.
- a miniature halogen counter tube for the range of 0–10 R/h.

Further data:

see LB 1200

RADIATION MEASURING INSTRUMENT RATO/F or LB 1200

Taking into operation

Turn left hand switch to "EIN" ("ON").

Adjust the right hand switch to the range desired.

Measuring gamma-radiation

Push the slide at the reverse side of the instrument over the counter tube window.

Measuring beta-radiation

Push the slide in opposite direction to the counter tube window.

Voltage control

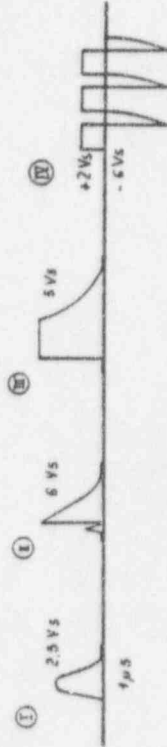
Turn the left hand switch to "K". The indication should now rise above the marking "K" in the upper scale. If it is below the marking "K", the DEAC-cells in the instrument have to be recharged. For this purpose the plug of the charger is put into the socket at the side of the instrument and the charging instrument into the Schuko-socket. The charging time is about 13 - 15 hours. During that time the instrument must not be switched on.



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RADIATION MEASURING INSTRUMENTS FOR INDUSTRY, SCIENCE AND MEDICINE



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